CLAIMS

1. A composite rare-earth anisotropic bonded magnet, comprising:

(A) 50 to 84 mass% of R1FeB coarse powder, comprising:

1. R1FeB anisotropic magnet powder with an average grain diameter of 50 to 400 μm, obtained by performing a hydrogenation treatment on an R1FeB alloy having a rare earth element including yttrium (Y) (hereafter, "R1"), iron (Fe), and boron (B) as its main ingredients; and

2. #1 surfactant that coats the surface of the constituent grains of the said R1FeB anisotropic magnet powder; and

(B) 15 to 40 mass% of R2Fe(N, B) fine powder, comprising:

1. R2Fe(N, B) anisotropic magnet powder with an average grain diameter of 1 to 10 μm, having a rare-earth element including Y (hereafter, "R2"), Fe, and nitrogen (N) or B as its main ingredients; and

2. #2 surfactant that coats the surface of the constituent grains of the said R2Fe(N, B) anisotropic magnet powder; and

(C) 1 to 10 mass% of a resin as binder;

this bonded magnet having the special features that maximum energy product (BH)max is 167 to 223 kJ/m^3, and permanent flux loss, which indicates the proportion of magnetic flux loss which can be obtained with remagnetizing after the passage of 1000

hours at 100 ℃, is 6% or less.

2. The composite rare-earth anisotropic bonded magnet recited in claim 1, wherein at least one of the above R1FeB anisotropic magnet powder or above R2Fe(N, B) anisotropic magnet powder includes 0.05 to 5 at% of one or more of the rare-earth elements (hereafter, "R3") consisting of dysprosium (Dy), terbium (Tb), neodymium (Nd), and praseodymium (Pr), when taking the whole as 100 at%.

3. The composite rare-earth anisotropic bonded magnet recited in claim 1, wherein at least one of the above R1FeB anisotropic magnet powder or above R2Fe(N, B) anisotropic magnet powder includes 0.01 to 1 at% of lanthanum (La), when taking the whole as 100 at%.

4. A composite rare-earth anisotropic bonded magnet production method comprising:

(1) A heat orientation process in which a mixture comprising:

(A) 50 to 84 mass% of R1FeB coarse powder, comprising

R1FeB anisotropic magnet powder with an average grain diameter of 50 to 400 μm, obtained by performing a hydrogenation treatment on an R1FeB alloy having R1, Fe, and B as its main ingredients, the surface of the constituent grains of R1FeB anisotropicmagnet powder being coated with a #1 surfactant; and

(B) 15 to 40 mass% of R2Fe(N, B) fine powder,

comprising

R2Fe(N, B) anisotropic magnet powder with an average grain diameter of 1 to 10 μm, having R2, Fe, and N or B as its main ingredients, the surface of the constituent grains of R2Fe(N, B) anisotropic magnet powder being coated with a #2 surfactant; and

(C) 1 to 10 mass% of a resin as binder

is heated to a temperature above the softening point of the said resin, and while keeping that resin in a softened state or melted state, an orienting magnetic field is applied so that the R1FeB coarse powder and R2Fe(N, B) fine powder are oriented; and

(2) A molding process in which, after the said heat orientation process, the mixture is heated and press molded;

this production method having the special feature that a composite rare-earth anisotropic bonded magnet is obtained in which the said R2Fe(N, B) fine powder and said resin are evenly filled into the gaps between constituent grains of the said R1FeB coarse powder.

5. The composite rare-earth anisotropic bonded magnet production method recited in claim 4, wherein the said mixture is comprised of a compound in which the surface of the constituent grains of the said R1FeB coarse powder is coated by a coating layer in which the said R2Fe(N, B) fine powder is evenly dispersed in the said resin.

6. The composite rare-earth anisotropic bonded magnet compound production method recited in claim 5, wherein the above compound is obtained after a heat kneading process in which the above R1FeB coarse powder, above R2Fe(N, B) fine powder, and above resin are heat kneaded at a temperature above the softening point of the said resin.

7. The composite rare-earth anisotropic bonded magnet production method recited in claim 5, wherein the above mixture is comprised of a preparative compact in which the said compound is filled into the cavity of the molding die and then press molded.

8. The composite rare-earth anisotropic bonded magnet production method recited in claim 4, wherein the above resin is thermosetting resin, and the above heat orientation process is performed heating at a temperature above the hardening point of the said thermosetting resin.

9. A composite rare-earth anisotropic bonded magnet compound comprising:

(A) 50 to 84 mass% of R1FeB coarse powder, comprising:

1. R1FeB anisotropic magnet powder with an average grain diameter of 50 to 400 μm, obtained by performing a hydrogenation treatment on an R1FeB alloy having R1, Fe, and B as its main ingredients; and

2. #1 surfactant that coats the surface of the constituent grains of the said R1FeB anisotropic magnet powder; and

(B) 15 to 40 mass% of R2Fe(N, B) fine powder, comprising:

1. R2Fe(N, B) anisotropic magnet powder with an average grain diameter of 1 to 10 μm, having R2, Fe, and N or B as its main ingredients; and

2. #2 surfactant that coats the surface of the constituent grains of the said R2Fe(N, B) anisotropic magnet powder; and

(C) 1 to 10 mass% of a resin as binder;

this bonded magnet compound having the special feature that the surface of the constituent grains of the above R1FeB coarse powder is coated by a coating layer in which the above R2Fe(N, B) fine powder is evenly dispersed in the above resin.

10. The composite rare-earth anisotropic bonded magnet compound recited in claim 9, wherein the relative density of the bonded magnet obtained when performing magnetic field heat molding under conditions of molding temperature 150 ℃, magnetic field 2.0MA/m, molding pressure 392MPa is 92 to 99%.

11. The composite rare-earth anisotropic bonded magnet compound recited in claim 9, wherein at least one of the above R1FeB anisotropic magnet powder or above R2Fe(N, B) anisotropic magnet powder includes 0.05 to 5 at% of one or more of the rare-earth elements (R3) consisting of Dy, Tb, Nd, and Pr, when taking the whole as 100 at% .

12. The composite rare-earth anisotropic bonded magnet recited in claim 9, wherein at least one of the above R1FeB anisotropic magnet powder or above R2Fe(N, B) anisotropic

magnet powder includes 0.01 to 1 at% of lanthanum (La), when taking the whole of each as 100 at%.

13. A composite rare-earth anisotropic bonded magnet compound production method comprising:

(1) A mixing process which mixes:

(A) 50 to 84 mass% of R1FeB coarse powder, comprising

R1FeB anisotropic magnet powder with an average grain diameter of 50 to 400 μm, obtained by performing a hydrogenation treatment on an R1FeB alloy having R1, Fe, and B as its main ingredients, the surface of the constituent grains of R1FeB anisotropicmagnet powder being coated with a #1 surfactant; and

(B) 15 to 40 mass% of R2Fe(N, B) fine powder, comprising

R2Fe(N, B) anisotropic magnet powder with an average grain diameter of 1 to 10 μm, having R2, Fe, and N or B as its main ingredients, the surface of the constituent grains of R2Fe(N, B) anisotropic magnet powder being coated with a #2 surfactant; and

(C) 1 to 10 mass% of a resin as binder; and

(2) A heat kneading process in which, the mixture obtained after the said mixing process is heat kneaded at a temperature above the softening point of the said resin;

this production method having the special feature that it obtains a compound in which the surface of the constituent grains of the above R1FeB coarse powder is coated by a coating layer in which the above R2Fe(N, B) fine powder is evenly dispersed in the above resin.

14. A composite rare-earth anisotropic bonded magnet with the special feature that it is obtained by the composite rare-earth anisotropic bonded magnet production method recited in any of claims 4 through 8.

15. A composite rare-earth anisotropic bonded magnet compound with the special feature that it is obtained by the composite rare-earth anisotropic bonded magnet compound production method recited in claims 13.